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10/501,369	07/14/2004	Norbert Auner	PACO 0101 PUSA	9387
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EXAMINER ZIMMER, ANTHONY J				
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1793				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/501,369

**Applicant(s)**

AUNER, NORBERT

**Examiner**

ANTHONY J. ZIMMER

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 28-53 is/are pending in the application.
- 4a) Of the above claim(s) 42-53 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 28-41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date \_\_\_\_\_

The objections to claims 28 and 34 are withdrawn as the arguments of applicant were persuasive.

*In response to the Restriction Traversal*

Applicant's election with traverse of Group I in the reply filed on 1/7/2008 is acknowledged. The traversal is on the ground(s) that there is no lack of unity, because there are two special technical features. This is not found persuasive, as all of the required claimed features of claim 28 (including applicant's alleged special technical features) are known in the art from the process of WO'250 as indicated in the office action of 9/6/2007 in view of the above arguments. It is noted that applicant's second alleged special technical feature "using an organic nonpolar solvent when chlorine, bromine, and iodine are used" is optional in the claim and therefore is not required as a common technical feature between the three inventions.

The requirement is still deemed proper and is therefore made FINAL.

***Response to Arguments***

Applicant's arguments filed 1/7/2008 have been fully considered but they are not persuasive

*In regard to the arguments in the rejection of claims 28-29, 34-36, and 39 as being anticipated under 35 USC 102(b) by Harwell (WO/01/14250, "WO'250")*

In response to applicant's argument that WO'250 does not produce amorphous silicon, the WO'250 reference teaches that amorphous silicon is produced by the process. See page 17, lines 27-31 and claim 24, part a.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the non inclusion of a polar solvent) are not recited in the rejected claim(s). The claim only requires that the reactant be in an apolar organic solvent, which is clearly taught by WO'250 by the inclusion of an apolar organic solvent such as hexane. See lines 29-32 of page 18 and claims 31, 233, and 34. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "particles which are composed exclusively of silicon metal (along with trace impurities)") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

*In regard to the rejection of claims 28, 30-33, 37-38, and 40 as being unpatentable under 35 USC 103(a) over US4756896 ("US'896") in view of WO'250*

Applicant argues that there is no motivation to combine WO'250 with US'896 because the references teach different solvents. However, the examiner used the WO'250 reference for the substitution of one halogen silane for another and not to substitute solvents. See *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007).

In response to applicant's argument that the WO'250 reference does not teach producing amorphous silicon particles, the WO'250 reference teaches that amorphous

silicon in nanoparticles (amorphous silicon particles) are produced by the process. See claim 24, part a). The claim does not require that the particles be particles which are composed exclusively of silicon metal. Furthermore, both references are combinable with each other in that each process produces silicon, in particular each teaches producing amorphous silicon from halosilanes, and are classified in the same international class C01B 33/02.

Applicant argues that one of ordinary skill would not combine the references because fluorine halosilane is used because it is available at low cost, and thus one of ordinary skill would not be motivated to use another halosilane. This argument is not found to be persuasive as US'896 teaches the use of a fluorine halosilane which is not excluded by the rejected claims.

Furthermore, the fluorine halosilane was used in US'896 because it was hard to find a use for its acid precursor which was a byproduct of phosphoric acid production (see column 3, lines 14-22), but in the case that a higher quality reactant is desired (one that does not contain any impurities from the phosphoric acid process) or when there is not present a phosphoric acid production process from which to draw the fluorine halosilane precursor US'896 fairly suggests using the halosilane of another halogen.

US'896 teaches the reduction of other halosilanes (silicon tetrachloride is mentioned) using sodium metal as a reducing agent. See column 1, lines 44-47. Furthermore, US'896 teaches reduction using the sodium metal in the presence of a solvent in order to perform the reaction at a lower temperature. See column 1, line 68-column 2, line 10. Thus one of ordinary skill would find it obvious to use the other

halosilanes (as provided from the process of WO'250) in order to perform the reduction at a lower temperature thus reducing energy costs.

Applicant also argues that neither reference teaches the requirements of instant claim 31. However, US'896 teaches decomposing sodium silicon fluoride (sodium fluosilicate, a hexafluoride salt) by heating it to produce silicon tetrafluoride gas (and also necessarily sodium fluoride (a metal fluoride)). This corresponds to instant claim 31 b) part ii). See claim 11 of US'896.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 28-29, 34-36, and 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Harwell (WO 01/14250, hereafter WO'250).

WO 01/14250 teaches a process that produces amorphous silicon comprising reducing a halosilane with a metal in a solvent under reflux, see WO 01/14250 claim 24 part (a). Furthermore WO 01/14250 teaches using halosilanes or organosilanes wherein the halosilane or organosilane is a compound of Br, Cl, I, or F, see WO 01/14250 claim 26. WO 01/14250 also teaches organic and nonpolar (apolar) solvents, see claims 31, 33, and 34 (where diethyl ether is a nonpolar (apolar) organic solvent). WO'250 teaches using silicon tetrachloride as a halosilane, see claim 27 of WO'250. Furthermore

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WO'250 teaches using sodium metal (a Group 1 metal), see claim 28. One of ordinary skill in the art at the time of the invention would have recognized the inherency of the reducing agent being deployed in a dispersion in an organic polar solvent. Diethyl ether, a nonpolar organic solvent, is used under reflux. The boiling point of diethyl ether and the temperature under which the reflux would necessarily run is 34.5°C. At this temperature sodium metal is in the solid state (mp = 95°C), so the solid sodium would necessarily be a solid dispersed in the solvent.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 28, 30-33, 37-38, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Häyhä (US4756896, hereafter US'896) in view of Harwell (WO 01/14250, hereafter WO'250).

In regard to claims 28 and 30-31, US'896 teaches reducing sodium silicon fluoride (a hexafluorosilicate salt), see claim 11, by heating it to produce silicon tetrafluoride gas and sodium fluoride, and reducing with an alkali or alkaline metal dispersed in a liquid intermediate agent, see claim 10. Mineral oil (a nonpolar, organic solvent) in particular is used, see Example 1. It should be noted that the use of a fluorine halosilane as provided by US'896 is not excluded by the claim.

US'896 fails to teach using a halosilane of chlorine, bromine, or iodine.

However, it would have been obvious to one of ordinary skill in the art to modify US'896 in view of WO'250 as WO'250 teaches using silanes or organosilanes of any halogen—Iodine, Fluorine, Bromine, or Chlorine—(see page 18 lines 3-4 or WO'250) in a similar process that produces amorphous silicon. From this is known in the art that any halosilane can be reduced to produce amorphous silicon (see WO'250 page 18 lines 3-4).

Thus, it would have been obvious to a person of ordinary skill in the art use a halosilane of any halogen including iodine, fluorine, and bromine, as a person of ordinary skill has good reason to pursue the known options within his or her grasp.

In regard to claims 32-33, 37, and 40, US'896 teaches a process of reducing a halosilane (silicon tetrafluoride) in a boiling organic, nonpolar solvent (mineral oil in particular) with molten sodium (or a Group 1 or 2 metal) dispersed and blended



(agitated) in the solvent. Furthermore US'896 teaches separating the amorphous silicon products from other reaction components. (see Example 1 and claims 1-19).

In regard to claim 38, US'896 does not explicitly teach performing the reaction at atmospheric pressure, but one of ordinary skill in the art at the time of the invention would have envisaged that this is the case, as US'896 does not mention performing the reaction under pressure or in a vacuum, and atmospheric pressure is standard operating procedure unless otherwise specified.

Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harwell (WO 01/14250) in view of Kotzsch et al. (US4044109).

Claim 41 is drawn to the process of claim 28 wherein crystalline silicon is the precursor to said halosilane or organosilane. Harwell teaches the process of claim 28 (see 102 rejection above).

Harwell fails to teach producing the needed reagent silicon tetrachloride from crystalline silicon.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Harwell in view of Kotzsch, as Kotzsch teaches a method for silicon tetrafluoride production from elemental (crystalline) silicon.

One would have been motivated to modify Harwell in view of Kotzsch in order to be able to use the crystalline silicon as a source for silicon tetrafluoride, purify the crystalline silicon, and to achieve the predictable result of creating amorphous silicon from crystalline silicon.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANTHONY J. ZIMMER whose telephone number is (571)270-3591. The examiner can normally be reached on Monday - Friday 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ajz

/Steven Bos/  
Primary Examiner, Art Unit 1793